

PAPERS.

37. The Alcyonaria of the Cape of Good Hope and Natal.—
GORGONACEA. By J. STUART THOMSON, Ph.D., F.R.S.E.,
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(Plates XLIII.–XLV.† and Text-figure 167.)

The Alcyonaria here reported on were collected during the years 1898 to 1907, off the coasts of Cape Colony and Natal. In a previous paper‡ I dealt with the Alcyonacea, and in the present report I confine myself to the Gorgonacea. This contribution is not, however, to be regarded as an exhaustive one, as, unfortunately, the specimens have come into my hands at different times. Professor Hickson has contributed two papers on South African Alcyonaria to the publication, 'Marine Investigations in South Africa,' and I have to thank him for allowing me to examine his type-specimens and microscopic slides of the spicules of various forms.

I have also to thank Professor J. D. F. Gilchrist, formerly Government Biologist at the Cape of Good Hope, who kindly entrusted these Alcyonarians to me for description.

In this paper, the following 19 species are described or recorded, of which 6 are new:—

Family BRIAREIDÆ.

Suberia capensis, sp. n., p. 871.

Spongioderma verrucosum Möbius, p. 874.

Family MELITODIDÆ.

Melitodes esperi W. & S., p. 874.

Melitodes nodosa W. & S., p. 876.

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Family ISIDÆ.

Ceratoisis ramosa Hickson, p. 877.

Family MURICEIDÆ.

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Acanthogorgia armata Verrill, p. 880.

* Communicated by Prof. ARTHUR DENDY, D.Sc., F.R.S., F.Z.S.

† For explanation of the Plates see pp. 892–893.

‡ "The Alcyonaria of the Cape of Good Hope and Natal.—Alcyonacea" (with our plates). Trans. Roy. Society Edinburgh, vol. xlvii. part iii. (No. 19), 1910.



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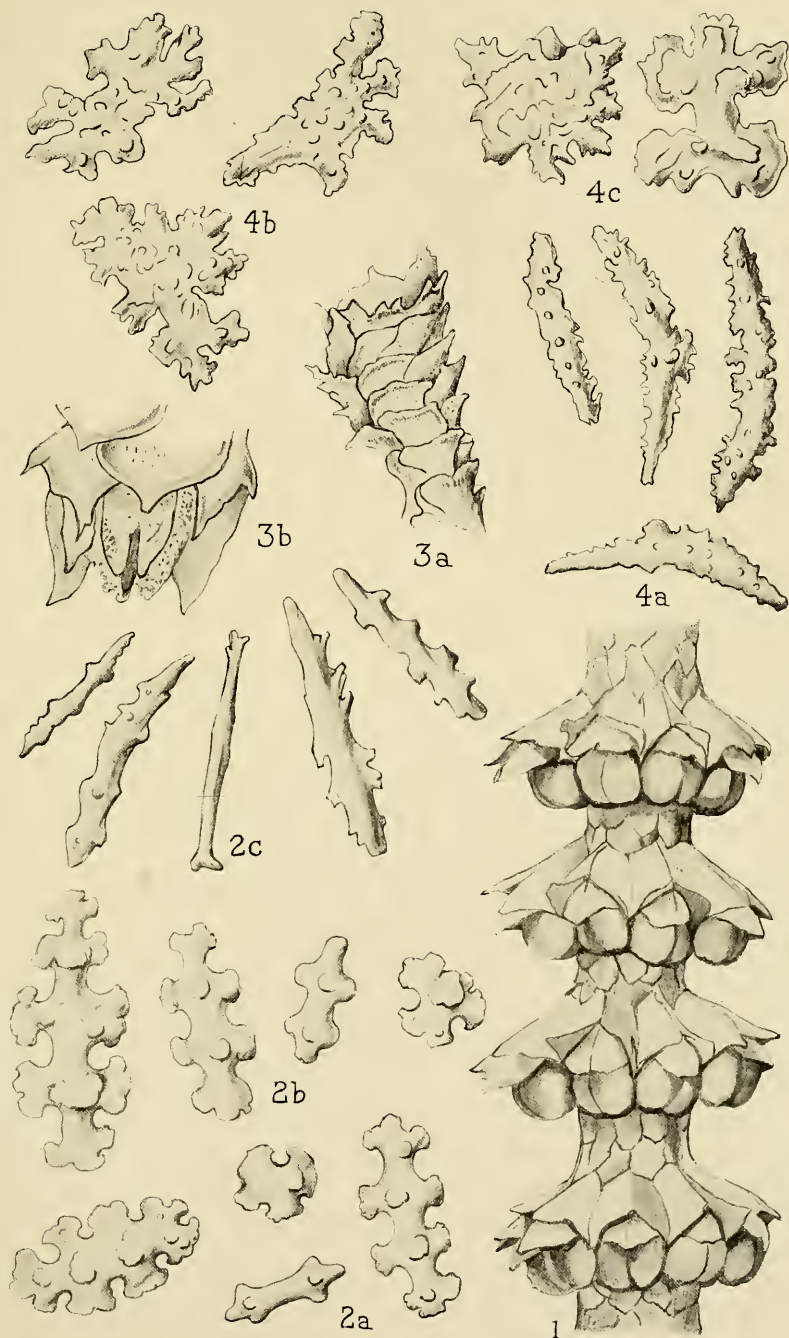
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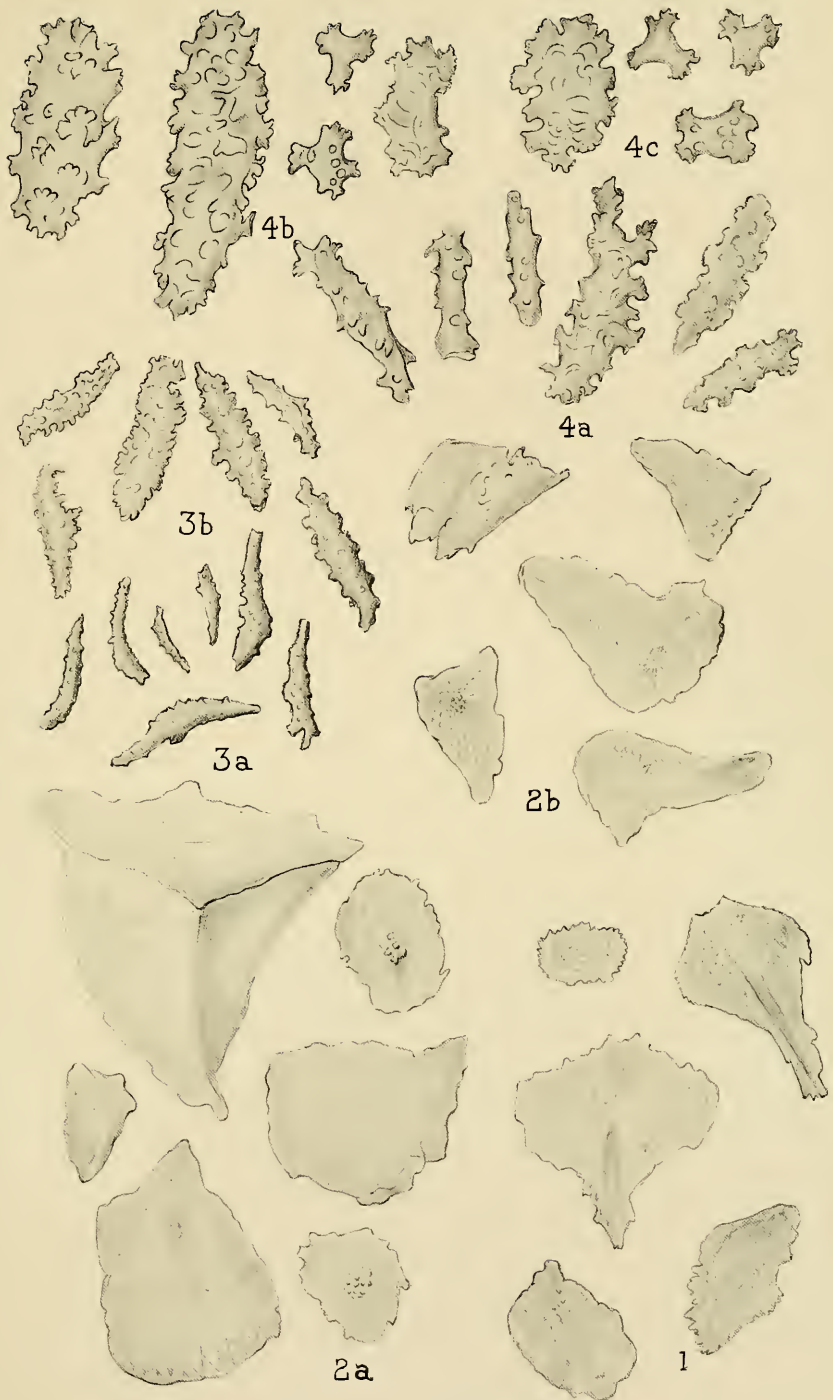
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ALCYONARIA OF THE CAPE OF GOOD HOPE.



ALCYONARIA OF THE CAPE OF GOOD HOPE.

Family PLEXAURIDÆ.

Eunicella papillosa Esper, p. 880.

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Gorgonia capensis Hickson, p. 887.

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Hicksonella spiralis Simpson = *Juncella spiralis*
Hickson, p. 889.

Family BRIAREIDÆ.

SUBERIA CAPENSIS, sp. n. (Pl. XLIII. fig. 4; Pl. XLV. figs. 4a-c.)

The colony is of a dark red colour, resembling that of *Gorgonia flammea* E. & S., and consists of (1) an encrusting base, (2) a more or less cylindrical trunk, and (3) an expanded apical part. The basal part is 10 mm. long, 13 mm. broad, and 6 mm. high. The trunk is about 27 mm. in height, 6 mm. in diameter basally and medially, and about 7 mm. apically. The lowest polyp is situated on the trunk about 13 mm. from the base. About fourteen polyps are situated near the apex of the trunk, and these are almost entirely confined to three sides. The largest polyps of this part are 2 mm. in height and 3 mm. in diameter. The distance of the polyps from one another varies considerably, namely from about 1 to 3 mm. The apical part of the colony is about 14 mm. in height and 15-17 mm. in diameter (including the polyps). The polyps are in this part more prominent than in the trunk region. They vary from 2-3 mm. in height and breadth. The polyps are irregularly scattered over the surface of the apical part, and the interval between them varies from about 1 to 5 mm. There are thirty to forty polyps in the apical part.

The entire surface of the colony is rough to the touch and has a tough consistency. In the centre of the colony there is a horny and limy axis; in other words, the axis consists of horny tissue and in association with this a large number of spicules. The spicules of the axis usually differ in form from those of the cortex.

There is a ring of canals immediately surrounding the axis and another ring occurs in the cortex. The polyps are retractile within the verrucæ. In my specimen all the polyps are retracted. Spicules are present in the anthocodiæ.

The spicules of the polyps are (1) small tri-radiate spicules with sharp spines on the blunt ends of the rays, this being the commonest type of spicules in the polyps; (2) rods with spines on the expanded ends, some of which approach a dumbbell shape; (3) approximately straight rods; and (4) spindles. The spicules are arranged in eight longitudinal bands on the anthocodiæ and do not appear to be in any definite arrangement in relation to one another. They are all red in colour.

The spicules of the axial part of the trunk are (1) colourless rods with few spines, (2) spindles with blunt processes, the latter with spines or thorns, and (3) irregularly-shaped spicules.

The spicules of the cortex of the trunk are most frequently spindles (with a similar shape to those of the axial part), tri-radiate spicules, short rods, and small irregularly-shaped spicules. The spindles are more characteristic of the cortex, and the rods of the axial part. The wall of the stomodæum contains numerous small red spicules, mostly tri-radiate forms.

The dimensions of the spicules are as follows:—From the polyps: (1) large spindles, from 0.119×0.085 to 0.188×0.119 mm.; (2) tri-radiate forms, from 0.051×0.0357 to 0.068×0.068 mm.; (3) 4-rayed forms, from 0.051×0.0425 to 0.068×0.051 mm.; (4) small dumbbell-like forms, but with double ends, about 0.051×0.020 mm.

From the cortex of the trunk: (1) large spindles, from 0.0935×0.0595 to 0.221×0.119 mm.; (2) small tri-radiate forms, from 0.0357×0.051 to 0.0595×0.022 mm.; (3) dumbbell-like forms approximately the same size as those of the polyp.

From the axial part of the trunk: (1) large spindles (only a few occur), from 0.204×0.1105 to 0.289×0.0935 mm.; (2) rods, from 0.085×0.0255 to 0.272×0.0765 mm.; (3) irregularly-shaped spicules, from 0.238×0.119 to 0.340×0.119 mm.

Locality, etc.—"Pieter Faure," No. 13139. Cape Morgan, N.N.E. $9\frac{3}{4}$ miles. Depth, 47 fathoms. Procured by dredge. Nature of bottom, broken shells. Only one specimen of this species was collected.

Studer gives the following diagnosis of the genus *Suberia*:—

"Stamm einfach oder verzweigt, aufrecht, mit einer Achse, die aus unverschmolzenen, von Hornsubstanz umgebenen stabförmigen Spicula gebildet wird und der Ernährungscanäle entbehrt. Rinde dick, enthält spindelförmige stachelige Spicula. Die Polypenwarzen sind gross, senkrecht vom Stamme abstehend, die Öffnung an der Spitze der Warzen achtstrahlig. Die Polypen von der Basis bis in die Tentakel mit feinen spindelförmigen Spicula erfüllt. Um die Achse ein Kranz von Längscanälen."

Studer adds that the genus *Suberia* stands near *Spongioderma*, but differs from it in the form of the calyx and spicules.

Three species of the genus *Suberia* have been described, and the following table shows the differences between them so far as these can at present be stated.

<i>Suberia capensis</i> , sp. n.	<i>Suberia genthi</i> Str.	<i>Suberia koellikeri</i> Str.	<i>Suberia clavaria</i> Str.
Colour, dark red.		Rose-red, disappearing in alcohol.	Flesh-coloured during life, disappearing in alcohol.
Simple, unbranched.	Branched.	Branched.	Simple, unbranched.
Height 53 mm.	80 mm.	About 110 mm.	160 mm.
Trunk cylindrical, expanded at the apex.	Cylindrical.	Cylindrical, branches expanded at the apices.	Cylindrical, expanded at the apex.
Polyps at the apex but not terminal, 2-3 mm. in height.	Polyps not terminal.	1-1.5 mm. in height.	Polyps thickly crowded together at the apex, 1-2 mm. in height.
The rind is firm and rough.		The rind is thin and rough.	The rind is soft and smooth.
The spicules are:—			
(1) rods, (2) spindles, (3) tri-radiate forms, (4) 4-rayed forms, (5) irregular spicules.	(1) straight warty spindles, (2) curved warty spindles, (3) 4-rayed forms, (4) double crosses, (5) irregularly branched spicules.	(1) rod-like spicules, (2) cross-shaped or triplets.	(1) slightly spined spindle-shaped rods, (2) crosses, (3) spinous spindles.
No canals in axis.	Canals in the axis.	Axis surrounded by a wreath of canals.	Axis as in the last species "well separated" and consists of long, slightly spined, spindle-shaped rods; crosses also occur.
Canals immediately outside the axis.	Canals in the circumference.	Axis consists of smooth rod-like spicules (with few spines) lying close to one another.	
Axis of horny tissue with numerous associated spicules.			
Dimensions of Spicules:—			
Large spicules, from 0.0935 × 0.0595 to 0.0289 × 0.0935 mm.;	Straight, warty spicules, from 0.09 × 0.08 to 0.34 × 0.10 mm.	Warty, thorny spicules, 0.24 and 0.021 mm. in length;	Spinous spindles from the rind, 0.1 to 0.18 mm. in length;
tri-radiate forms, from 0.0357 × 0.051 to 0.068 × 0.068 mm.	curved, warty spindles from 0.24 × 0.12 to 0.30 × 0.10 mm.;	rods ("Drilling") from axis, 0.35 mm.	long, slightly spined, spindle-shaped rods, 0.237 and 0.265 mm. in length.
rods, from 0.085 × 0.0255 to 0.272 × 0.0765 mm.;	long, spiny, curved spindles, from 0.4 × 0.04 to 0.24 × 0.4 mm.;		
irregularly-shaped spicules from 0.238 × 0.119 to 0.340 × 0.119 mm.	irregularly branched spicules, from 0.24 to 0.06 mm. in widest diameter;		
dumbbell-shaped forms about 0.051 × 0.020 mm.	4-rayed forms, 0.32 to 0.06 and 0.20 to 0.12 mm.;		
	double crosses, from 0.1 to 0.025 and 0.08 to 0.01 mm.		
Habitat:—South Africa, Cape Morgan, N.N.E., 9½ miles. Depth, 47 fms. By dredge. Bottom, broken shells.	Shallow water, off Port Jackson (Australia).	North of New Zealand.	Atlantic, off Monte Video

SPONGIODERMA VERRUCOSUM Möbius.

This species has already been described from South African waters by Hickson in his paper on the Alcyonaria and Hydrocorallinæ of the Cape of Good Hope, Part I.

Localities, etc.—Apparently a shallow-water form.

"Pieter Faure," 12310. Port Shepstone, north, 8 miles. By dredge. Depth, 36 fathoms. Nature of bottom, broken shells and stones. Date, October 30, 1902.

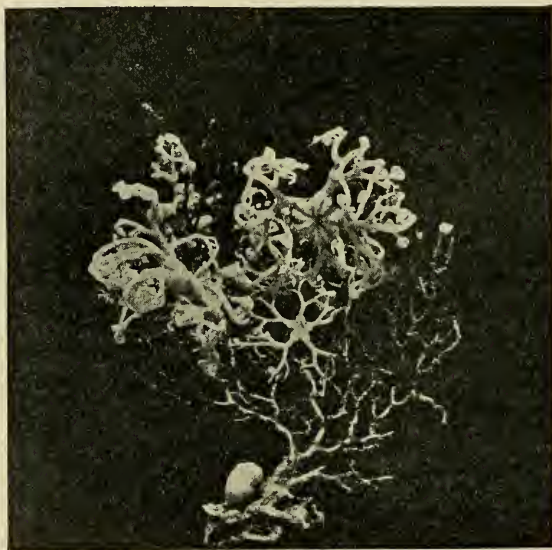
"Pieter Faure," 11127. Umkomass River mouth, N.W. by W. $\frac{1}{2}$ W. $5\frac{1}{2}$ miles. By large dredge. Depth, 40 fathoms. Nature of bottom, broken shells and stones. Date, December 30, 1900.

Family MELITODIDÆ.

MELITODES ESPERI W. & S. (Text-fig. 167.)

The specimen is about 104 mm. in length and 117 mm. in breadth, but these dimensions are only approximate as several of the terminal branches were broken away. The colony had three beautiful young specimens of *Gorgonocephalus* intertwined among its branches.

Text-fig. 167.



Melitodes esperi and *Gorgonocephalus*.

The colony is red in colour, and is attached to the substratum by a broad, trunk-like base. The branches are mostly in one plane, although a few are slightly turned inwards in a direction

vertical to the main axis. There is a slight anastomosis of the branches; the meshes thus produced are very irregular in shape. Sometimes branches, which may be slightly divided, are seen growing into the meshes; these offshoots may arise from the internodes, but this is rare.

The nodes and internodes are very distinctly marked, the former being dark red and the latter light red in colour. The internodes vary in length from 2 mm. near the base to 9 mm. towards the apex of the colony. The nodes are more or less ring-shaped, but they have a slight projection in front. The nodes are smaller towards the apices of the branches than near the bases and are not so easily distinguished from the internodes. Near the base the nodes may be 4 mm. in length and 3 mm. in diameter; towards the apex they are about 1 mm. in length and diameter.

The axis consists of long needle-like spicules densely compressed together. The lower part of the axis is not perforated by canals. On a branch of average size, the diameter of the axis is about 1 mm. The internodes of the axis are pale pink, the nodes darker in colour.

The base of the colony is a thick trunk about 5 mm. in diameter, but it soon divides and gives rise to the branches. The branches are disposed in a more or less fan-shaped manner. Various organisms, such as Polyzoa, Brachiopods, and Hydroids, are thickly grouped at the base of the colony.

The *cœnenchyma* covering the axis is about $\frac{1}{6}$ of a millimetre in thickness: its surface is densely covered by an extremely large number of spicules of varied size and shape. A rough surface is produced by the slightly protruding spicules.

The contracted polyps appear as yellow papillæ on the surface of the *cœnenchyma*, and are about .6 mm. in height and 1 mm. in breadth. On the large, basal branches of the colony, the polyps are only distributed on three sides, but on the apical branches they occur on all sides. Polyps are situated on the nodes, and not simply confined to the internodes. The spicules of the polyps are yellow, and are arranged in eight areas.

The spicules of the *cœnenchyma* are of the following forms:—

Clubs, with broad leaf-like processes; curved spindles with narrow processes, some of these spicules are so much curved as almost to form a semicircle; straight spindles of two forms: (*a*) those with small processes, and (*b*) those with broad, expanded processes; other spicules are irregular in shape, owing to the presence of broad processes, which produce a more or less branched appearance; one of these spicules has, for example, three apical prongs or processes.

The spicules of the *cœnenchyma* are all red in colour.

The spicules of the polyps are as follows:—

Straight spindles fairly similar in form to those of the *cœnenchyma*; curved spindles, also fairly similar in shape to those of the *cœnenchyma*, some of these spindles are bifurcated at the end

in a similar manner to that shown by Wright and Studer for this species; straight rod-like spicules with rounded processes; clubs and spicules of an irregular shape.

The spicules of the polyps are yellow in colour.

The spicules of the cœnenchyma have the following dimensions:—(a) Clubs, from 0.102×0.054 to 0.187×0.076 mm.; (b) curved spindles, from 0.085×0.0204 to 0.238×0.047 mm.; (c) straight spindles, from 0.0765×0.0204 to 0.272×0.0646 mm.; (d) irregularly-shaped spicules, from 0.085×0.068 to 0.119×0.068 mm.

The dimensions of the polyp spicules are as follows:—(a) straight spindles, from 0.081×0.037 to 0.153×0.025 mm.; (b) curved spindles, from 0.122×0.034 to 0.187×0.034 mm.; (c) clubs, from 0.085×0.034 to 0.136×0.051 mm.; (d) irregular spicules, from 0.076×0.110 to 0.170×0.034 mm.

Locality, etc.—P.F. 852. About 25 miles east of East London. Lat. $32^{\circ} 48' 30''$ S.; Long. $28^{\circ} 11' 15''$ E. By shrimp trawl. Depth, 22 fathoms. Nature of bottom, mud. Date, January 11, 1899.

MELITODES NODOSA W. & S.

The specimen was not complete, the base being absent and many of the terminal branches had become broken away. The entire colony probably measured 230 mm. in length and 120 mm. in breadth. The branches all arise in one plane. The nodes are very prominent, measuring as much as 6 mm. in diameter and 5 mm. in height near the base of the colony, and 2 mm. in diameter and 1.5 mm. in height on the small apical branches. The internodes vary considerably in length, namely, from 2 mm. near the base of the colony to 12–13 mm. on the terminal branches. The internodes are more or less cylindrical, and their diameter varies from about 3 mm. near the base to 1 mm. at the apex. Several of the branches originate from the internodes, as in the specimens of this species collected by the 'Challenger.' There is a slight anastomosis near the base of the colony, produced by branches springing from the nodes.

On the upper branches the polyps are distributed on all sides; on the lower part, however, they are mostly confined to three sides. The polyps are retractile within well-defined verrucæ, which measure about 1 mm. in diameter and 0.75 mm. in height.

The ground colour of the colony is yellow, the nodes are brown, the verrucæ yellow. The axis, when deprived of the overlying cœnenchyma, is brown at the nodes and white at the internodes.

The cœnenchyma is rough owing to the presence of numerous spicules and has a thickness of 1–2 mm. The surface of the cœnenchyma has longitudinal grooves. The spicules of the cœnenchyma are (1) irregularly-curved spindles, (2) irregularly-branched spicules, (3) curved, spinous spindles, (4) 4-rayed forms. Their dimensions are as follows:—Irregularly-curved spindles, from 0.204×0.059 to 0.238×0.051 mm.; irregularly-branched spicules, from 0.0765×0.068 to 0.136×0.085 mm.; curved,

spinous spindles, from 0.153×0.025 to 0.170×0.025 mm.; 4-rayed forms, 0.051×0.051 mm.

The spicules of the polyps are (1) curved spindles, (2) straight spindles, and (3) irregular spicules. The dimensions of these spicules are as follows:—Curved spindles, from 0.136×0.017 to 0.250×0.034 mm.; straight spindles, from 0.023×0.051 to 0.255×0.056 mm.; irregular spicules, from 0.068×0.051 to 0.170×0.085 mm. The spicules of the polyps may be contrasted with those of the *cœnenchyma* by the predominance of straight and curved spindles.

The 'Challenger' specimens were collected (1) off the New Hebrides at a depth of 60–120 fathoms, (2) on *Hyalonema*-ground, off Japan, at a depth of 345 fathoms. These specimens differ from mine in the colour of the *cœnenchyma* and axis; the *cœnenchyma* being reddish brown and the axis yellowish red. In both, the polyps were yellow and the nodes darker than the internodes. The shape of the spicules of my specimen rather differs from that of the 'Challenger' forms, but, on the other hand, the spicules seem to vary so much within this species that I do not feel inclined to lay great stress on this point.

Locality, etc.—P.F. 18381. Off Flesh Point, N. 6 miles to Flesh Point, N. $\frac{3}{4}$ W. $6\frac{1}{2}$ miles. By large trawl. Date, January 15, 1904.

MELITODES DICHOTOMA Pall.

Fragments of a red variety of this species. This species has already been recorded from the Cape. It is interesting to note its occurrence in such shallow water, namely from 6–14 fathoms. At Gordon's Bay, in all probability it may be thrown up on the shore during storms, as is so much the case with *Gorgonia flammea* E. & S.

Locality, etc.—P.F. 15725. Off Gordon's Bay. By dredge. Depth, 6–14 fathoms. Nature of bottom, rock. Date, October 20, 1902.

Family ISIDÆ.

CERATOISIS RAMOSA Hickson. (Plate XLIII. fig. 1.)

This beautiful form has already been described by Hickson from South African waters. The species is very fragile, and the delicate terminal branchlets are very liable to become broken away. In Hickson's specimen the base was wanting, but my specimens are more complete in this respect. The calcareous base measures about 8 mm. in length, 4 mm. in breadth, and 2 mm. in height.

The height of the complete specimen would be about 100 mm. The first part of the main stem immediately above the base is brown or bronze in colour.

My specimens agree with Hickson's description of forms collected off Vasco da Gama Peak at a depth of 230 fathoms.

The distribution of colour on the colony appears to vary. The

ivory-white internodes, as described by Hickson, appear to become reddish in the upper part of the colony, but this is apparently not always the case.

Locality, etc.—P.F. 13197. Cove Rock, N.W. $\frac{3}{4}$ W. $13\frac{1}{2}$ miles. By dredge. Depth, 80–130 fathoms. Nature of bottom, coral and rocks. Date, July 30, 1901.

Family MURICEIDÆ.

MURICEIDES FUSCA, sp. n. (Plate XLIV. figs. 4 a-c.)

The colonies are about 102 mm. in height and 95 mm. in breadth. The branches are all in one plane. The main trunk has a strong horny axis and an expanded base measuring 14 mm. in length and 12 mm. in breadth. The main trunk has a diameter of 5 mm. and gives off its first branch 13 mm. from the base. The branches of the first order are given off irregularly from the trunk, and these, in their turn, give off branches of the second order, which may also bear small terminal branches. The branches of any order do not, as a rule, originate opposite one another. The axis of all parts is thick, the cœnenchyma thin. The axis is brown near the base, and light yellow at the apices.

The main trunk is fairly cylindrical, but the branches are slightly flattened. This flattening of the branches appears to be due to the manner in which the cœnenchyma grows over the axis, as the latter is fairly cylindrical in shape. The upper branches are thin and flexible, but their apices are expanded. The polyps are mainly confined to three sides of the axis. The general surface of the cœnenchyma is covered by small, protruding spicules. These spicules do not overlap, but there are only minute spaces between them.

The polyps are also well protected by spicules. There is a crown of spindles, in which the spicules are disposed *en chevron*, in eight triangular areas which are very pointed towards the apices. In each of these triangular areas there appear to be about 8–12 spindles, which are placed more or less vertically to the surface. At the base of those areas the spindles are arranged in a continuous ring surrounding the polyp. The spindles forming the ring also overlap one another, but not to such an extent as those in the triangular areas. There appear to be about ten spicules at any one place in this ring, enumerating in a proximo-distal direction. Distally to this ring, spicules of another form are situated on the polyp wall. These are very protuberant, and stand more or less in a vertical direction. These spicules are "*Blattkeulen*" and pass over basally into small spicules of the same general form as those of the general surface of the cœnenchyma, namely "*Kalkkörper*." The entire polyp is thus well protected by spicules.

The polyps are capable of being withdrawn within the verrucæ, but the latter are small and do not rise any distance beyond the surface of the cœnenchyma. The polyps vary considerably as to

the degree of extension, but the apices of the tentacles are never seen to any extent.

In all the better expanded polyps, the crown of spindles is very apparent. This crown has frequently a reddish or brownish coloration. The general surface of the colony has a greyish colour, which is produced by the spicules.

Owing to the varying degree of extension, the polyps naturally vary considerably in size.

The verrucæ have minute lobes, measuring as much as 2 mm. in height and 1.6 mm. in diameter.

The cœnenchyma is thin at all parts and sometimes is 1 mm. in thickness.

The axis of the secondary branches varies in diameter, from about 1.3 mm. in the lower branches to 1 mm. in the apical branches.

The interval between the polyps varies from about .1 mm. to 1.9 mm. There is a terminal polyp at the apices of the branches.

The spicules of the crown of the polyp are straight or curved spindles, armed with blunt tubercles. The majority of the spindles are very much curved, but a few are straight. The tubercles have a tendency to great irregularity of shape, and vary very considerably. The spicules from this part also vary notably in shape, some being rod-like, others club-like, but there are all transitions between the different forms. The number of tubercles or spines also varies considerably, in some spicules there are scarcely any, in others they are numerous. In some of the more curved spindles there is a secondary offshoot from the main axis about the middle of its length.

The spicules of the lower part of the polyp differ, as a rule, in shape from those of the upper crown. Many of the spicules from this part are "*Blattkeulen*," others are more of the form termed by Kölliker "*Kalkkörper*." There is much variety in the shape of those spicules, probably every stage grading the one into the other. There are also a few spicules similar to those occurring in the crown of the polyp, namely curved spindles. There are other spicules which may be more appropriately termed spinous clubs.

The superficial spicules of the cœnenchyma are much smaller than those of the polyp. They are mostly small "*Kalkkörper*" with irregular blunt processes coming off in all directions, less frequently there are short spindles with broad processes.

The dimensions of the spicules are as follows:—Spindles of the polyp crown, from 0.102×0.017 to 0.340×0.085 mm.; "*Blattkeulen*" of the lower polyp, from 0.17×0.119 to 0.289×0.085 mm.; "*Kalkkörper*" of the lower polyp, from 0.153×0.119 to 0.204×0.153 mm.; "*Kalkkörper*" of the cœnenchyma, from 0.047×0.030 to 0.105×0.076 mm.; spindles of the cœnenchyma, from 0.030×0.023 to 0.088×0.061 mm.

There was unfortunately no label attached to this specimen, and thus the exact locality cannot be stated.

Nutting has given the following diagnosis of the genus *Muriceides* :—

“MURICEIDES W. & S. (emended).

Muriceides Studer + *Clematissa* Studer, Archiv f. Naturgesch., Jahrg. liii. Bd. i. pp. 54, 55.

Muriceides Wright & Studer + *Clematissa* Wright & Studer, ‘Challenger’ Reports, the Alcyonaria, 1889, pp. lii, liii, 105, 106.

“Calyces cylindrical, or in the form of truncated cones, their walls filled with vertically-placed spindles, often modified into clubs, discs, or triradiate forms vertically placed, but not ‘en chevron,’ and not forming a true crown of points around the margin. The opercular spindles are placed ‘en chevron’ on the tentacle bases. The cœnenchyma contains spicules of various forms, and the branches may, or may not, end in calyces.”

ACANTHOGORGIA ARMATA Verrill.

The colony is irregularly branched. The cœnenchyma is thin, and filled with conspicuous, white spicules. The verrucæ are elongate, often curved, capitate or clavate, surmounted by eight groups of long, divergent, sharp spicules, with an irregular “chevroned” arrangement.

The axis has a yellowish-brown colour. The spicules are white, rough, curved, and fusiform. The colour of the colony is ash-grey.

This species has been previously recorded by Hickson from off Vasco da Gama Peak, 230 fathoms. There are three good examples in the present collection.

Locality, etc.—P.F. 18857. Cape Morgan, N. $\frac{3}{4}$ W. 13 miles. Depth, 250–320 fathoms. By shrimp trawl. Nature of bottom, broken shells. Date, July 8, 1906.

Family PLEXAURIDÆ.

EUNICELLA PAPILLOSA Esper. (Plate XLIII. figs. 2 & 3.)

The colony measures 162 mm. in length and 112 mm. in breadth. It has a basal encrusting part measuring 11 mm. in length and 15 mm. in breadth. The branches are all disposed in one plane. The verrucæ occur over the entire surface of the colony, even on the flat encrusting base. The main axis and most of the branches are cylindrical, but occasionally some of the upper branches are slightly flattened. Proceeding from the main stem, the branches gradually decrease in diameter but expand again near the apices. Some of the branches have a few local enlargements, but these are probably not of specific importance. The verrucæ give to the colony its papillated appearance; the largest are about 2 mm. in height and 1.2 mm. in diameter, the smallest are only fractions of a millimetre. The surfaces of the verrucæ are covered by a mass of spicules. A rough transverse

section through a branch shows (1) the horny brown axis in the centre, (2) a ring of canals grouped round the axis, and (3) externally, the cavities of the polyps arranged in a circumferential series.

The spicules are situated on the verrucæ, on the septa between the polyp cavities and surrounding the horny axis. These spicules are very abundant and are as a rule placed in a radial direction; they are of two kinds, viz. (1) the characteristic torch-like spicules and (2) spindles. The torch-like spicules measure about 0.068×0.025 and the spindles from 0.0935×0.034 to 0.136×0.0374 mm.

A portion of a colony of *Eunicella papillosa* was dredged in Simon's Bay during the voyage of the 'Challenger,' and Hickson has also recorded it from Rij Bank (Algoa Bay) at a depth of 25 fathoms. Hickson also draws attention to the remarkable resemblance between the spicules of *Gorgonia albicans* and those of *Eunicella papillosa*, more especially in regard to the torch-like spicules.

He says, "The examination of my preparations of spicules alone would lead any one to the conclusion that they were taken from the same species. Yet the specimen of *Eunicella papillosa* obtained on Rij Bank, 25 fathoms, has a cylindrical axis and prominent verrucæ, whilst the specimen of *Gorgonia albicans* picked up on the beach at Port Alfred has a very much flattened axis, thin cenenchyma, and inconspicuous verrucæ."

Hickson thinks that there is justification in transferring *Eunicella papillosa* to the family Gorgoniidæ, and that *Eunicella papillosa* and *Gorgonia albicans* should probably be included in the same genus.

Locality, etc.—P.F. 15801. Off Seal Island, S.S.E. $2\frac{1}{2}$ miles, and Seal Island, S. by E. $2\frac{1}{2}$ miles. Procured by dredge. Depth, 9–10 fathoms. Nature of bottom, broken shells. Date, October 30, 1902.

PSAMMOGORGIA PULCHRA, sp. n. (Pl. XLIII. fig. 5; Pl. XLV. figs. 3 a & b.)

This very beautiful form has an orange ground-colour, with the red tips of the tentacles projecting. The colonies are not all complete. A small colony (P.F. 858) consists of a fairly flat, expanded, basal part which gives rise to two upright shoots, one of which branches into two, the other being simple. The basal part of the colony is 11 mm. in length, 6 mm. in breadth, and 3 mm. in height. The simple, upright shoot is 9 mm. in height, 2 mm. basally and 4 mm. apically in diameter. The other (divided) shoot is 28 mm. in height, 3 mm. in diameter at the base and 5 mm. at the apex. The branches are thus expanded at the apex. Another specimen (13345), which is probably not quite complete, has a very small basal part. The base gives rise to a main shoot (2 mm. in diameter), which at a distance of 9 mm. from its origin sends off a lateral branch about 12 mm. in height; a second small branch is given off from the main shoot after an

interval of 12 mm. This second branch measures 11 mm. in length and 3 mm. in diameter.

The main shoot is 21 mm. in height and has a diameter of 5-6 mm. at the apex.

The surface of the coenenchyma is covered with large, yellow spicules, which are easily seen with the naked eye. They lie adjacent to one another but do not overlap, the boundaries of each being clearly defined. These superficial spicules of the coenenchyma do not appear to be arranged in any very definite manner in relation to one another; they are of such varied sizes that any great regularity is prevented. It may, however, be observed that all the superficial spicules of the coenenchyma have their long axes in the direction of the longitudinal axis of the colony; in the verrucae, the spicules have a corresponding position in relation to the polyps.

The spicules of the cortex are (1) broad spindles, yellow in colour, (2) long narrow spindles, of a pale colour. The spicules project very much on the surface at all parts. The spicules of the anthocodiae are red and are long spindles arranged 'en chevron' in eight longitudinal, triangular areas. At the base of these strips, a layer of spicules forms a ring round the polyp. This ring is composed of two or three spicules lying one behind the other in a proximo-distal direction.

The verrucae have a circle of projecting spicules, only one layer deep. This circle consists of 14-16 yellow spicules which lie with their long axes parallel to the length of the polyps. These projecting spicules appear to be more prominent towards the apex of the colony. The general appearance of the polyp spicules reminds one, at first sight, of the setting of a stone in a finger-ring; the anthocodia with its red spicules resembling a jewel which is surrounded by little rivets, namely, the large, yellow spicules of the verrucae. The degree to which the anthocodiae are exposed beyond the verrucae varies to some extent; as a rule, eight triangular areas are easily seen, in other cases there is only a minute area with spicules or only an opening at the apex of the verrucae. The axis is horny in the centre, but with long narrow needles or spindles on its surface. These axial spicules are about 0.340 mm. in length and 0.051 in breadth; their margins are almost smooth. In a rough transverse section, the axis is seen to be composed of a large central grey area surrounded by a brown ring. The axis is not penetrated by canals.

The polyps occur on all parts of the colony including the basal encrusting part; they are arranged in a spiral manner on the branches. The polyps are about 1.5 mm. in height and 2 mm. in diameter.

The dimensions of the spicules are:—(1) large, yellow spindles, from 0.081×0.039 to 0.123×0.021 mm.; (2) small, yellow spindles, from 0.042×0.024 to 0.093×0.033 mm.; (3) red spindles, from 0.021×0.0015 to 0.114×0.0135 mm.; (4) long needle-like spicules of the axis, 0.340 mm. in length by 0.051 mm. in breadth.

Localities, etc.—P.F. 13345. Off Cape Morgan, N.N.W. 7 miles. Depth, 52 fathoms. By dredge. Nature of bottom, rocks, sand, and shells. Date, August 12, 1901.

P.F. 858. Off and east of Cape Morgan. Depth, 36 fathoms. By dredge. Nature of bottom, stones. Date, January 12, 1899.

Verrill's diagnosis of the genus *Psammogorgia* is as follows:—"Corallum dichotomous or subpinnate, with round branches. Axis horn-like. Cœnenchyma moderately thick, the surface finely granulated with small rough spicula. Cells scattered, sometimes flat, more frequently raised in the form of rounded verrucæ. Polyps with rather large, elongated, slender warty spindles at the bases of the tentacles. Spicula of the cœnenchyma mostly short, thick, and very rough, warty spindles and rough, warty clubs of moderate size."

Eleven other species of *Psammogorgia* have been described.

EUPLEXAURA MEDIA, sp. n. (Plate XLIV. figs. 2 a-c.)

The colour of the colony is bright red, with white polyps. A large part of the colony is concealed beneath a thick growth of Hydroids, and thus the exact dimensions of the specimen are rather uncertain. It was probably about 25 cm. in length.

In the lower part of the colony the axis is much flattened, but towards the apex it becomes rounded. The large axis near the base of the colony is 3.5 mm. in one diameter and 1.6 mm. in the narrow diameter. The axis is very small towards the apex of the colony, and is surrounded by the canals in a circular manner. The axis is hollow, and has the structure described by Wright and Studer for the genus *Euplexaura*.

The base of the colony is missing. The branches are all in one plane and vary in diameter at different parts of their length. They are thick near the base, narrower medianly, and expand again near the apex.

The polyps are arranged in an irregular spiral round the branches. The polyps are in many cases fairly well extended, but others are retracted and appear only as minute pores on the surface of the cœnenchyma. These pores vary in shape, some are circular or oval, others are slit-like and elongated in the direction of the long axis of the branch. The pores are from .3 to .5 mm. in diameter. A well-expanded polyp is about 1.2 mm. in length and .5 mm. in diameter.

Each tentacle has about ten pairs of pinnules. The spicules are situated at the bases of the tentacles and extend in a distal direction. There is, firstly, a series of spicules on the polyp surface in a line with the tentacles, and, secondly, another series placed intermediate to the first. The second series has not so many spicules as the first. The spicules in each of these series are not arranged in a very regular manner.

The cœnenchyma is dense and granular. The spicules are arranged in a very dense layer in the cortex, but there are fewer towards the axis.

The spicules of the cortex are mostly spindles with irregular, blunt processes. Some have a simpler form than others. The spicules of the centre resemble those of the cortex, but simpler forms occur such as rods (with small processes) and crosses. The spicules of the polyps are very minute, needle-like or rod-like spicules, with blunt processes.

The dimensions of the spicules are as follows :—Spindles of the cortex, from 0.059×0.034 to 0.085×0.034 mm.; spindles of the centre, from 0.051×0.034 to 0.085×0.051 mm.; rod-like spicules of the polyps, from 0.064×0.008 to 0.112×0.034 mm.

This species resembles *Euplexaura braueri* Kükenthal, *E. albida* Kükenthal, and *E. parviclados* Wright & Studer. It has the closest resemblance to *Euplexaura braueri* Kükenthal, the spicules of which are almost identical with it except in size. My specimen differs, however, from *Euplexaura braueri* in the arrangement of the polyp spicules and in other points. From the shape of the spicules alone, one would probably conclude that they belonged to the same species.

Locality, etc.—P.F. 742. Between Roman Rock and Cape Recife. Depth, 17 fathoms. By dredge. Nature of bottom, corals. Date, December 12, 1898.

Family MALACOGORGIIDÆ.

MALACOGORGIA CAPENSIS Hickson.

The colony consists of a main stem (with an expanded, basal, attaching part) which divides at some distance from the base into two primary branches; one of the latter gives rise to three, the other to eleven secondary branches. The polyps are situated on the secondary branches. The main stem is cylindrical and measures 50 mm. in length by 4 mm. in diameter. The basal, attaching part has a diameter of 6 mm. The polyp-bearing branches are long and slender, the longest in my specimens being 80 mm., the shortest 27 mm. in length.

The branches originate in the manner shown in Hickson's figure, coming off right and left in one plane.

There are no polyps at the bases of the secondary branches, thus leaving bare areas, 3–7 mm. in length. The younger polyps are situated near the bases of the branches. The polyps are fully expanded; a large one measures 1 mm. in length and about .75 mm. in diameter. The general appearance of the polyp reminds one superficially of a contracted Hydra. On the lower part of the branches the polyps have a bilateral arrangement, but higher up, and especially near the apices, they originate on all sides and form a dense cluster.

The tentacles are about 0.4 mm. in length and have 12 pairs of pinnules.

The axial part of the secondary branches has a diameter of 0.5 to 1 mm.

I am able to confirm Hickson's statement regarding the absence of spicules in this genus. My specimens are larger than that described by Hickson, and the polyps in his form are also smaller. My specimens, however, agree well with his description.

Hickson gave the following diagnosis of the genus *Malacogorgia*:—

"Colony slightly branched. Axis horny with no trace of lime. No spicules in any part of the colony. Polyps arranged bilaterally in the plane of branching at the basal two-thirds of the secondary branches and on all sides of the terminal one-third of the secondary branches.

"*Malacogorgia capensis*, with the characters of the genus. Colour in spirit, white."

Hickson placed this form in a new family, the Malacogorgiidae. He gave the characters of the new family as follows:—"Colony branched and upright. Axis slender, horny. Spicules and all other forms of calcareous skeleton absent."

Localities, etc. P.F. 18729. Bird Island (near Cape Seal), E. by N. $\frac{1}{4}$ N. 5 miles. By large trawl. Depth, 40 fathoms. Nature of bottom, mud. Date, August 29, 1905.

P.F. 703. Lat. $33^{\circ} 53' 15''$ S., Long. $25^{\circ} 51' 45''$ E. By large trawl. Depth, 26 fathoms. Nature of bottom, mud.

FAMILY PRIMNOIDÆ.

STACHYODES GILCHRISTI, sp. n. (Pl. XLIV. fig. 1; Pl. XLV. figs. 2 a & b.)

The specimens are not complete. The branching is in one plane, but is neither dichotomous nor regular. The polyps are arranged in verticils which are separated from one another by an interval of about a millimetre, but the degree of separation varies considerably at different parts of the colony. There are on an average five verticils to every ten millimetres. The length of a large verticil is about 3 mm. on the ad-axial and 2.5 mm. on the ab-axial side. The verticils are about 5.5 mm. in diameter.

The axis, which is brown on the lower part of the colony and yellow nearer the apex, is covered by sclerites which vary considerably in size and shape. These sclerites covering the horny axis are thin and fairly transparent. The diameter of the axis is about .35 mm.

In each verticil there are usually five polyps. The polyps are protected by three pairs of sclerites, namely an ad-axial pair, a median pair, and an ab-axial pair. The ad-axial pair consists of long sclerites which are produced outwards in a lateral direction, the median pair are smaller. The ad-axial and median spicules have sharp, rather angular margins, and when the latter are viewed from the side, they appear like spines. The ab-axial pair of sclerites have slightly ribbed or dentate margins. The ad-axial sclerites of the two lateral polyps form a ring or tunnel embracing

the main axis. The sclerites vary considerably in size, but they probably range from 0.085×0.153 to 4.0×2.0 mm.

The diameter of a branch in the intervals between the verticils is about 3 mm.

The sclerites covering the axis have the following forms:—(1) triangular, (2) quadrangular, (3) forms with curved sides, and (4) irregular forms.

The systematic position of this species is near *Stachyodes trilepis* Pourtalés and *Calyptraphora josephineæ* Lindström.

Locality, etc.—P.F. 11966. Cape Vidal (Natal), N.N.E. $\frac{1}{4}$ N. $9\frac{1}{2}$ miles. Depth, 80–100 fathoms. By dredge. Nature of bottom, rocks. Date, February 27, 1901.

THOUARELLA HICKSONI, sp. n. (Pl. XLIV. figs. 3 a & b; Pl. XLV. fig. 1.)

The colony is more or less bottle-brush-like, but it gradually tapers off towards the apex. The dimensions of the colonies vary, the largest specimen was 66 mm. in length and 25–28 mm. in diameter. The central stem gives rise to the polyp-bearing branches in a spiral manner.

These branches vary in length, they are longer near the base of the main stem, and gradually decrease in size towards the apex. The branches are as a rule simple, but in some cases there are secondary and tertiary branches. The primary branches are not arranged in a regular spiral as the distance between their points of origin is not the same in all cases. The interval between the origin of two primary branches on the central stem is frequently about 1 mm.

The axis is horny, flexible, yellow and iridescent, and its surface is covered with imbricating spicules. It is more or less oval in transverse section. When the spicules are removed from the surface of the axis, fine longitudinal lines or striæ are seen. There are generally three spicules in a transverse row on the axis of a branch. The diameter of a branch is about 0.391 mm.; that of the horny axis about 0.136 mm.

Most of the polyps are situated on the primary, secondary and tertiary branches, but sometimes they occur on the central stem. On the branches they originate singly, and are disposed in a spiral manner. The polyps are pear-shaped, and their surfaces are covered by imbricating scales. The size of the polyps varies considerably, the following dimensions may be noted:—(1) 1.088×0.629 mm.; (2) 0.476×0.306 mm.; (3) 1.343×0.595 mm.; (4) 0.595×0.374 mm.; (5) 0.935×0.663 mm.; (6) 0.612×0.391 mm.

The interval on the branches between the polyps also varies but not to any extent. The distance is generally from .5 to .6 of a millimetre. In some polyps, the tentacles were extended beyond the verrucæ, and the pinnules were seen, though not sufficiently well to determine their number. There are on an average about twenty-six spicules on each verruca and these are disposed in six transverse (excluding the opercular spicules) and four or five

longitudinal rows. The spicules of the verrucæ show considerable variation; they may be grouped in two sets, namely (1) those covering the lower or general surface of the verrucæ, and (2) the apical or opercular spicules. The lower spicules of the verrucæ are triangular, rectangular, scale-like or plate-like spicules. In their imbricate arrangement and also in their shape, these spicules remind one of the scales of fishes. Their surface is marked, except near the margin, by a number of small, rounded pores, which are arranged more or less in rows running in the direction of the long axis of the polyp. The margins of these scale-like spicules is frequently, wholly or partially dentate. The opercular spicules situated at the apices of the verrucæ differ in shape from those last described. They are more or less triangular, with a projecting spine in front, the entire spicule resembling a Skate (*Raia*) in form. These opercular spicules are eight in number and their spines project towards the central opening of the verruca. The surface of these opercular spicules have pores similar to those of the lower part of the verruca.

The dimensions of the spicules are as follows:—(a) lower spicules of the verrucæ from 0.1105×0.1615 to 0.187×0.221 mm.: (b) the apical or opercular spicules (including the spine) from 0.289×0.136 to 0.561×0.255 mm.

The spicules covering the main stem of the colony are similar to those of the lower part of the verrucæ, but are frequently much smaller. They have a more or less irregular arrangement and do not as a rule overlap one another. Their size is very variable, ranging from 0.068×0.025 to 0.221×0.153 mm.

Around the basal part of the colony a Polyzoan is encrusted, and intertwined among the upper branches are small Ophiuroids.

Locality, etc.—P.F. 14265. Off Cape St. Francis, N.E. by E. 32 miles. By dredge. Depth, 74 fathoms. Nature of bottom, rocks. Date, February 19, 1902.

Family GORGONIIDÆ.

GORGONIA CAPENSIS Hickson.

This is a beautiful example of a species described by Hickson from the Cape in 1900.

Hickson's specimen is larger, namely 250 mm. in length, while my example is only 140 mm. long.

The spicules are warty spindles ("Doppelspindeln" of Kölliker). The average length of these spindles in Hickson's specimen is 0.1 mm.; in mine they are smaller, namely, from 0.0544×0.034 to 0.0935×0.034 mm.

In 1900 Hickson recorded this species as a viviparous Alcyonarian, and in 1905 Thomson and Henderson corroborated this discovery in specimens from Ceylon.

The Ceylon specimens were collected in deep as well as in shallow water. They were larger than either of the Cape specimens, and were practically white. Hickson's specimen was